

AD-A194 506

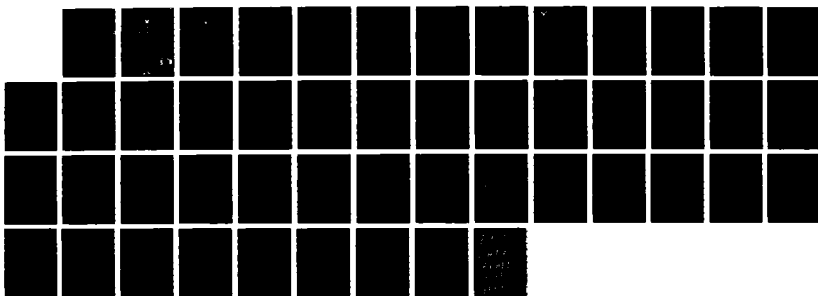
PROPOSED IMPROVEMENTS TO THE USAF FLIGHT SCREENING
PROGRAM(U) AIR COMMAND AND STAFF COLL MAXWELL AFB AL
D M KNUTSEN MAY 88 ACSC-88-1485

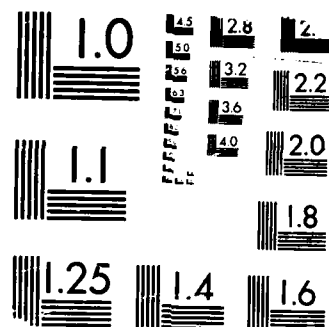
1/1

UNCLASSIFIED

F/G 5/9

NL



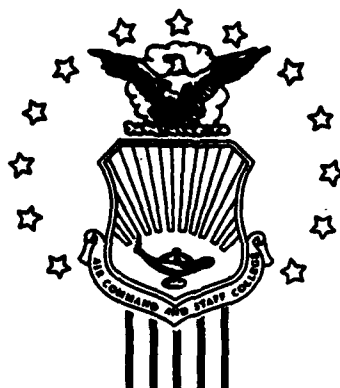


MICROCOPY RESOLUTION TEST CHART
(NBS 1963-A)

DTIC FILE COPY

2

AD-A194 506



AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

PROPOSED IMPROVEMENTS TO THE
USAF FLIGHT SCREENING PROGRAM

Major Douglas W. Knutsen 88-1485

"insights into tomorrow"

DTIC
ELECTE

JUN 15 1988

SE

This document has been approved
for public release and sale in
distribution is unlimited.

88 6 14 018



REPORT NUMBER 88-1485

TITLE PROPOSED IMPROVEMENTS TO THE USAF FLIGHT
SCREENING PROGRAM

AUTHOR(S) MAJOR DOUGLAS W. KNUTSEN, USAF

FACULTY ADVISOR Major Alan W. Schoolcraft, ACSC/3821 STUS

SPONSOR Colonel Richard W. Stokes, Jr., HQ ATC/DOTF

Submitted to the faculty in partial fulfillment of
requirements for graduation.

AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY
MAXWELL AFB, AL 36112-5542

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

11/11/88 506

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0168

1. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT STATEMENT "A" Approved for public release; Distribution is unlimited.		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION ACSC/EDC		6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Maxwell AFB AL 36112-5542			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
11. TITLE (Include Security Classification) PROPOSED IMPROVEMENTS TO THE USAF FLIGHT SCREENING PROGRAM (U)					
12. PERSONAL AUTHOR(S) Knutsen, Douglas W., Major, USAF					
13a. TYPE OF REPORT		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1988 May	
15. PAGE COUNT 38					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This study looks at ways to improve USAF Flight Screening Programs (FSP) in order to reduce attrition in Undergraduate Pilot Training (UPT). A literature search was performed to discover what had already been done in this area. A synopsis of several studies on FSPs is included in the text. This study fills a void in the literature by comparing the USAF FSPs to other service and foreign FSPs. This approach identified several different ways to screen potential pilot candidates. Some of these flight screening techniques could reduce USAF UPT attrition rates if implemented in the USAF FSPs. Further consolidation and standardization of USAF FSPs and increased emphasis on light aircraft screening offer the greatest potential to reduce attrition in UPT.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS				21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL ACSC/EDC Maxwell AFB AL 36112-5542				22b. TELEPHONE (Include Area Code) (205) 293-2867	
				22c. OFFICE SYMBOL	

PREFACE

This research project looks at ways to improve the United States Air Force (USAF) Flight Screening Programs (FSP) by way of attrition reduction. Attrition in UPT has increased, at an alarming rate, from 10.7% in FY 79 to 36.9% in FY 87. The FY 87 attrition rate cost the USAF some \$37 million in direct training costs. As a result the USAF needs to find ways to improve flight screening, so as to better predict those pilot candidates who will successfully complete UPT.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



—ABOUT THE AUTHOR—

DOUGLAS W. KNUTSEN

Douglas Knutsen was born and grew up in St. Louis, Missouri. He attended Southern Illinois University in 1969 and received a Bachelor of Arts degree in the field of American Studies in 1972. Receiving a commission from the United States Air Force in 1972, he attended Undergraduate Pilot Training, graduating in 1973. His first assignment, following UPT, was flying B-52's at Wurtsmith AFB, Michigan with the 524th Heavy Bombardment Squadron. Following this assignment, he reported next to Reese AFB, Texas, where he served in the following capacities: T-37 Instructor Pilot, Class Commander and T-37 Student Branch Side Chief, and Foreign Training Officer. Moving on to Randolph AFB, Texas, he served in the 3305th School Squadron as an Instructional Programs Developer. He, then, became a Program Objective Memorandum Staff Officer in DCS/Plans at Randolph. Reassignment to the Pentagon in 1985, appointed him to the Airlift and Training Systems Program Office, Directorate of Operational Requirements, DCS/RD&A (HQ USAF), Washington D.C. In this capacity he was responsible for developing requirements and advocating solutions to solve operational deficiencies in airlift and training systems for HQ USAF. Upon completion of Air Command and Staff College, he is being assigned to fly a T-38 at Williams AFB, Arizona.

TABLE OF CONTENTS

Preface.....	iii
About the Author.....	iv
List of Illustrations.....	vi
Executive Summary.....	vii
CHAPTER ONE - INTRODUCTION	
Statement of the Problem.....	2
Research Methodology.....	2
Research Assumptions.....	2
Research Limitations.....	3
CHAPTER TWO - CURRENT USAF FLIGHT SCREENING PROGRAM	
USAF Pilot Indoctrination Program.....	4
OTS Flight Screening Program.....	5
AFROTC Light Aircraft Training.....	6
CHAPTER THREE - LITERATURE REVIEW ON USAF FSP's.....	7
CHAPTER FOUR - FOREIGN COUNTRY & USN FSP's	
USN.....	13
Canada.....	17
Germany.....	18
Italy.....	20
Israel.....	21
Great Britain.....	23
CHAPTER FIVE - CONCLUSIONS/RECOMMENDATIONS.....	25
BIBLIOGRAPHY.....	30

LIST OF ILLUSTRATIONS

TABLES

TABLE 1--USN FSP Parts.....	16
TABLE 2--Canada's FSP Parts.....	18
TABLE 3--Germany's FSP Parts.....	20
TABLE 4--Italy's FSP Parts.....	21
TABLE 5--Israel's FSP Parts.....	23
TABLE 6--Britian's FSP Parts.....	24
TABLE 7--Compiled USAF, USN, and Foreign FSPs.....	25



EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DoD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

—“insights into tomorrow”

REPORT NUMBER

88-1485

AUTHOR(S)

MAJOR DOUGLAS W. KNUTSEN, USAF

TITLE

PROPOSED IMPROVEMENTS TO THE USAF FLIGHT
SCREENING PROGRAM

I. Purpose: To compare the present USAF Flight Screening Programs with those of other nations and services and identify potential changes to the USAF's programs that would lower attrition rates in UPT.

II. Problem: The UPT attrition rates have steadily increased in the past ten years from 10.7% to 36.9%. This is a costly problem which could potentially be affected by changes to the pilot candidate Flight Screening Programs. There is a wealth of research data available on flight screening processes except in the area of comparing other program designs.

III. Data: This study examines past and present flight screening programs in the USAF and compares them with the USN and five other foreign nation flight screening programs. The countries included in the study include Canada, West Germany, Italy, Israel, and the United Kingdom. They were selected due to the similarity in culture, heritage, and other societal similarities. They also have similar follow-on pilot training programs. A brief synopsis of the primary similarities and differences of each program follows.

The United States Navy FSP is a centralized program conducted over 14 weeks at Pensacola Naval Air Station, Florida. The program is one of only two in the study group that does not include some type of psychomotor or light aircraft screening. In every other respect the FSP is very comprehensive. The Navy's follow-on attrition rate in UPT averages 30%.

The Canadian FSP like the USN is centralized and conducts no light aircraft screening. The Canadian Forces Aircrew Selection Center controls and conducts a standardized screening process which takes two days. It is the shortest program looked at in the study group. The follow-on attrition rate in UPT is 35%.

The West German FSP conducts a centralized program. It is also one of the more comprehensive programs taking into account factors such as physical condition, motivation, leadership, survival, light aircraft screening, etc.

The Italian FSP is also centralized and comprehensive. A unique feature is that the light aircraft screening is broken into two parts separated by a year. The earlier phase is designed to motivate and indoctrinate with the later phase concentrating on screening. The average UPT attrition has been 18.5%.

The Israeli FSP is the most unique of any country or service included in the study group. It combines and coordinates all aspects of flight screening from interviews with a psychiatrist and aptitude testing to survival treks and light aircraft screening. The Israelis still have a conscript which makes their selection process unique in that they have some 5,000 pilot candidates for 200 flying positions.

The British FSP has the lowest follow-on attrition rates in UPT. The main difference in their FSP is the extensive light aircraft screening and training administered to the pilot candidates. The program has 63 hours of flying and introduces and trains the candidates in basic flight maneuver, navigation, acrobatics and low level flying. In addition to the light aircraft screening the program is highly centralized, standardized and comprehensive.

IV. Conclusions: In looking at the USAF, foreign nation's and the USN's flight screening programs substantive differences in design was the exception. The primary differences noted were in the area of emphasis or degree of application in one area versus another. The programs however, that had extensive and stringent demands in the

light aircraft screening and conducted training had significantly lower attrition rates in their respective UPT programs.

Further, those programs which were more comprehensive in all categories and were highly centralized and standardized in their approach to screening had the lowest attrition rates. The only exception to this was the Israeli FSP which has the highest attrition rate in UPT. This is directly attributable to the high number of applicants some 5,000 considered for the number of slots available in UPT some 200. The USAF FSPs are evolving to a more centralized and standardized approach by regionalizing and emphasizing screening like that conducted by OTS at Hondo. However, this centralizing and standardizing could be consolidated further to include all FSPs in the USAF.

Finally, it's this author's view that if a concerted effort was made to follow the guidelines set forth in the ATC "Hasty Blue" project, lower attrition rates in UPT could be achieved.

Chapter One

INTRODUCTION

The Air Training Command is continually striving to improve the efficiency of its operations. The goal is more effective training at less cost. The most expensive course we operate is Undergraduate Pilot Training (UPT). High attrition in UPT is an unacceptably costly burden with the average cost per eliminatee now about \$16K. One way to reduce attrition is to select students more carefully, entering into UPT only those who have a high probability of successfully completing the training. ... (10:Forward)

This quote by Lieutenant General William McBride, Commander of Air Training Command in 1973 is from ATC's Hasty Blue project. It is as relevant today as it was then. It recognized early on the important role USAF FSPs played in pilot production. More recently, at the HQ USAF "Pilot Selection and Screening Conference" of 13-15 April 1982, the following was said:

Due to escalating costs of training and increased complexity of our weapon systems it is increasingly imperative that we pick the best qualified candidate to enter UPT....many indicators point to the need to improve our ability to select successful pilot candidates. Some examples given were rising attrition rates, demanding mission requirements and increased training costs. (14:1)

ATC's Hasty Blue project was implemented in 1973 with the expressed goal of reducing attrition in UPT from approximately 17% to 10%. (10:3) Since that time attrition has steadily risen to 36.9% in FY 1987. (9:3) The associated lost training costs of an attrited student has risen from an average of \$16,000 in 1973 to the present average of approximately \$50,000 in 1988. (33:--) That cost represents a 300% increase during a 15 year period. Attrition in UPT is a significant problem today costing the USAF some \$37 million in direct training costs alone. (33:--) This attrition figure doesn't take into consideration any capital or lost potential costs. As can be seen, attrition has a significant and direct negative impact on the cost of training pilots.

The negative impact of attrition contributed to drive the average cost of training one student, in FY 87, to \$457,000. (33:--) Further, statistical trends indicate and predict that pilot retention and military budgets will continue to decline into the 1990's. This merely adds emphasis to the necessity of the USAF to improve flight screening in order to reduce UPT attrition.

PROBLEM STATEMENT

Can the USAF Flight Screening Programs be improved to reduce the attrition rates experienced in UPT?

RESEARCH METHODOLOGY

This study approached the problem of trying to identify changes or improvements to the USAF FSPs that would reduce attrition in UPT. Initially, data was gathered on the current USAF FSPs to gain an in-depth understanding of the way the USAF determines a pilot candidate's potential to complete UPT. This information is presented in chapter two of this study. At this point it was deemed necessary to conduct a literature search on FSPs in order to gain an appreciation for the depth and scope of research previously accomplished in this field. It became apparent that a large body of information and ongoing research was available on various aspects of flight screening processes. A complete listing of this information is referenced in the related sources section of the bibliography. Additionally, a synopsis of the more significant research projects is presented in chapter three. However, during this search no significant work was discovered that compared and/or analyzed the USAF FSPs with other service or foreign country FSPs. So this became the focal point for this research project.

The information gathered on other flying screening programs is presented in chapter four. The other FSPs discussed include those in the United States Navy, Canada, West Germany, Italy, Israel, and the United Kingdom. And, finally, chapter five attempts to analyze the data gathered and offer recommendations on ways to improve the USAF FSP and reduce the attrition rates in UPT.

ASSUMPTIONS

The first assumption is that flight screening includes all conscious discriminators used, physical or mental, to determine those individuals most likely to succeed in UPT.

The second assumption states that flight screening begins immediately following candidate recruitment and ends when the candidate enters UPT. Third, any light aircraft (propeller driven) that primarily identifies and attrites weak students is considered part of the flight screening process. The fourth assumption is that no discrimination will be made between factors which screen for pilots versus officer qualities, as one is a subset of the larger category. Assumption five defines UPT as any program which leads to the awarding of Air Force wings. And, finally, a FSP is judged to be doing it's job well when the FSP attrition is high and the UPT attrition is low.

RESEARCH LIMITATIONS

This research effort is constrained by the following limitations. First, Air Training Command is looking at making significant changes to the way it trains pilots in the 1990's and beyond. These changes are not considered in the scope of this study. Second, the FSP analysis does not include screening that is used in recruiting officers. Third, the countries selected for comparison are not a scientifically based sample but rather represent only those countries that responded. Third, statistics used, when reference is made to USAF UPT, only include data compiled from the five USAF UPT wings and not the Euro-Nato Joint Jet Pilot Training program at Sheppard AFB, Texas. Finally, the sheer size of our training program gives unique advantages and disadvantages that make comparisons with other FSPs unrealistic in some areas.

Chapter Two

CURRENT FLIGHT SCREENING PROGRAM

At this point it is useful to go into a brief description of the current USAF FSPs. This is necessary in order to establish some common ground or basic knowledge about the USAF FSP which can then be analyzed and compared with other FSPs. The USAF conducts three separate FSPs, and each is associated with one of the following officer commissioning programs: the United States Air Force Academy (USAFA) conducting the Pilot Indoctrination Program (PIP); the Air Force Reserve Officer Training Corp (AFROTC) conducting the Flight Indoctrination Program (FIP); and the Officer Training School (OTS) conducting the Flight Screening Program (FSP). (29:--) Each commissioning source screens pilot candidates for entry into UPT. The following text describes each of the three FSPs in detail.

USAFA

First, there is the USAFA, a rigorous four year military institution of higher learning. The cadets start off by competing for appointments to attend the USAFA. The rigors don't stop at the front gate. Each cadet while at the Academy goes through a challenging academic, military, and physical program. (23:14)

All students are offered the opportunity in the "Soar for all Program" to gain an appreciation and first hand knowledge of manned flight. The program consists of motor-glider, sailplane, and the Cessna T-41 orientation programs. Each cadet is offered the opportunity to solo in the sailplane, and those that can qualify go on to become instructors. The program is a great motivator for cadets interested in pursuing a career in military aviation. (8:--)

All of the cadets that desire to go to UPT participate in the T-41 Pilot Indoctrination Program (PIP) during their senior year. The PIP program is structured to simulate a typical UPT environment. It is designed to further motivate the cadets and to identify (screen) those most likely to complete UPT. (8:2) The program is composed of 7.5 hours of academics and 21 hours of flight time in the T-41. (8:2) The academic program covers ground operations, aircraft systems, aerodynamics, and emergency procedures. The flying program works on basic aircraft control, stalls, and traffic patterns. (8:--) Upon completion of the PIP program and the academic school year, the cadets are commissioned and sent

directly to a UPT wing. The PIP average attrition rate is approximately 10%.

OTS

Second, there is the Officer Training School (OTS) located at Lackland AFB, Texas. A college degree is a prerequisite to attend OTS and receive a commission in the Air Force. Prior to reporting to OTS candidates must undergo additional screening. The screening is composed of a physical examination and taking the AFOQT battery of tests. (32:-->) The next test for pilot candidates is the Portabat testing. This testing screens for eye-hand coordination and determines how quickly a candidate can assimilate and apply new information. (32:-->) At this point in time, the Portabat test is only being used to collect data in order to validate it's accuracy. (32:-->)

The Flight Screening Program (FSP) is conducted at Hondo Air Field, Texas. The program consists of 9 academic hours and 14 hours of flight instruction. (11:12) The FSP unlike those at the USAFA and AFROTC, is intended only to screen pilot candidates that exhibit the qualities required to complete UPT. The academics concentrate on ground training, aircraft systems, communications, aerodynamics, navigation, and emergency procedures. (11:-->) The flight instruction covers basic aircraft control, stalls, traffic patterns, and emergency procedures. (11:-->) The FSP average attrition rate is approximately 22%. (9:13)

Following the flight screening the OTS trainees go through an intense officer qualification period of training. When they successfully complete the course the trainees are commissioned and sent to UPT. Normally, the time between flight screening and the start of UPT is minimal. (32:-->)

AFROTC

Third, there is the AFROTC commissioning program. Here the cadets or students participate in military science programs while attending civilian universities nationwide. To get into the AFROTC scholarship program, students participate in a screening process that considers previous school records, a medical examination, leadership qualities, and commander interviews. (29:-->) All of the previous factors along with the candidates GPA and SAT scores are factored into a rating called the Quality Index Score which is used to compete for acceptance and program scholarships. (13:-->) Students wishing to go to UPT are also tested on the Air Force Officer Qualifying Test (AFOQT) and must score at

least at the 50th percentile to be considered for a flying slot at UPT. (27:--) AFROTC students are evaluated over a two to four year period of time. The evaluation takes place in the classroom, summer encampments, and during the Light Aircraft Training for ROTC (LATR). (29:--)

LATR is a relatively new screening program for ROTC. It has replaced numerous locally contracted Flight Instruction Programs with two regional training centers (Hondo Air Base, Texas and Embry-Riddle Aeronautical University, Florida) that will train all AFROTC pilot candidates. (12:--)

The flight screening consists of 9 hours of academic training and 14 hours of flight training. (12:1) The new LATR program combines qualities of the USAFA and the Officer Training School flight programs. The program, like the USAFA's, is designed to motivate and train students toward Air Force careers and, like the OTS program, is designed in an aggressive (stressful) way to identify those students best qualified to complete UPT. The academic program covers ground operations, aerodynamics, T-41 systems, and emergency procedures. The flying portion of the program concentrates on basic aircraft maneuvering, stalls, and traffic pattern work. (12:--) After completion of the summer encampment and flight screening, the AFROTC student waits more than a year before going on to UPT. (27:--) Upon successful completion of LATR and graduation from the school, the AFROTC students are commissioned and sent to UPT. The attrition rate in LATR, conducted at Hondo and Embry-Riddle, averages approximately 25%. (27:--)

As can be seen, the path to UPT varies depending upon the commissioning source. As the study progresses, analysis and comparison of other flight screening programs is now possible. However, at this time a turn to the past is in order to see where we've been and what progress has been made in improving the USAF FSPs. For readers unfamiliar with, Air Training Commands, FSPs the author recommends reading a staff report titled the: Proposed Modernization of the USAF Pilot Selection System, by Major Ralph Miller. (23:--)

Chapter Three

LITERATURE REVIEW ON USAF FSP's

As noted in the introduction, a great deal of research has been conducted on ways to improve the USAF's FSPs. However, the imperative to reduce attrition rates in UPT in 1988 and the future is as important today as it was when Lt Gen McBride initiated the "Hasty Blue" project in 1973. Therefore, in order to focus this study and avoid duplication of effort, a detailed literature review was conducted.

During this literature review eight previous studies were found that dealt specifically with the USAF screening of pilot candidates for UPT. The studies examined ways to improve flight screening in order to reduce attrition. The remainder of this chapter will present, in chronological order, a synopsis of each of the eight studies.

Evaluation of Light Plane Training Among AFROTC Student Officers, by John Cox and Cecil Mullins, in 1959. The study looks for correlation between factors such as the AFOQT scores and completion of the Flight Instruction Program (FIP), the FIP program and motivation or career intent, and the FIP program and attrition in Primary and Basic training in UPT. (17:2) The study tracks the progress of two control groups of senior AFROTC students from the class of 1957. (17:3) The control groups were matched as closely as possible based on AFOQT scores, school size, and other demographic considerations. The difference is half the students went to schools having FIPs and the other half to non-FIP schools. The study concludes there is little relationship between AFOQT scores and successful completion of the FIP. Also, it shows no significant relationship between the FIP and motivation or career intent. There is, however, a strong positive relationship between FIP completion and successful completion of UPT. The non-FIP pilot candidates had a significantly higher attrition rate (30%) than FIP pilot candidates. It was determined to graduate 100 pilots. The USAF would have to enter, into primary training, 134 FIP versus 174 non-FIP screened ROTC students. (17:--)

Evaluation of the AFROTC Flight Instruction Program, by Cecil Mullins and John Cox, April 1960. The authors revisit the data from their previous study and change, slightly, some of the conclusions. They temper their conclusions recognizing that the pilot portion of AFOQT scores gives some positive indication of how a student will do in the FIP and even follow-on training in UPT. They,

also, indicate that a FIP does provide some motivation toward a flying career. (17:--)

Plan for Centralized Selection of Students for Under-graduate Pilot Training (Project Hasty Blue), by HQ/ATC, 1972. The objective of this study is to "develop and implement a centralized ground-based system for selecting students for Jet UPT, so as to assist in reducing the Jet UPT attrition rate to 10% by end FY 77." (10:1) This is the project that not only established the FSP at Hondo, Texas in the T-41, but also looks at future ways to screen for and conduct UPT in the 1980's. (10:3) The selection and screening program established uses the AFOQT, Class I physical, and the following light aircraft screening programs: FSP for OTS, FIP for ROTC, and PIP for the USAFA. (10:4) The project's mission analysis directed the School of Military Sciences, formerly OTS, and Air Force Human Resources Laboratory (AFHRL), Lackland AFB, to design, develop, and validate tests to screen for psychomotor skills, attitude and career intent, and motivation. Further, they looked at ways to integrate use of the GAT-1 psychomotor testing device and altitude chamber in screening. (10:--) Students going through the screening programs were tracked in UPT with the results being reported back to HRL for further study. (10:--) To date, the AFOQT, Class I physicals, and centralized flight screening at Hondo, Texas, for all OTS and ROTC (different syllabus) students is currently the way the Air Force screens it's pilot candidates.

Pilot Screening: A Better Way?, by Donald Hickman, May 1975. This is the first study following the Headquarter Air Training Command "Hasty Blue" project. The study aims at improving the USAF Flight Screening Programs (FSP) in order to lower pilot candidate attrition rates in UPT. The study outlines each of the USAF FSPs' (AFROTC, USAFA, and OTS) syllabus differences, training philosophies, and attrition rates in UPT. The author goes on to explore the possibility of screening pilot candidates for factors such as motivation, stress tolerance, and psychomotor skills. The author recommends that these types of factors be incorporated in a "pre-flying" testing program. He further recommends that the AFROTC Flight Instruction Program be cancelled and consolidated with the OTS Flight Screening Program at Hondo, Texas. (20:--)

View of an Innovative Change to the Air Force Reserve Officers' Training Corps' (AFROTC) Flight Instruction Program (FIP), by Ronald Wojack, May 1981. This research paper examined the potential effectiveness of conducting the AFROTC FIP program in conjunction with the summer field training encampments. The author makes several assumptions. Most

noteworthy is that the FIP is more cost effective than letting AFROTC pilot candidates enter UPT directly (without going through the FIP). (25:1) The study outlines the Congressional law authorizing the FIP as a motivating and pilot screening tool. At that time the flying hour program consisted of 25 hours of the 36 originally authorized by the Congress. The study goes on to outline the following problems associated with the FIP: number of contracts (141), insurance, awarding contracts, adherence to regulations, standardization, and student waivers (ie. breaks in training). (25:5-6) This study does not advocate replacing AFROTC control of the FIP but rather advocates an alternative format for the FIP. The alternative would simply consolidate the FIP with the AFROTC summer field training encampments. This program would have the following advantages: concentration of the flying program, standardization, military environment (similar to UPT), administration (positive control), and reduced operating costs. The author concludes, while the current FIP may motivate pilot candidates, it falls short in the area of screening. (25:21) It is estimated that the alternative program would result in a cost savings of approximately 50% in terms of "time, manpower, and money." (25:22) A test program was established for ROTC pilot candidates to attend their FY84 summer encampment at Lackland AFB and go through the FSP at Hondo.

Cost Impact Should Improved Screening Methods Be Implemented in the Undergraduate Pilot Training Program, by Charles Flitschen, May 1981. Once again, this study of the USAF FSP addresses the importance of screening as a cost avoidance necessity due to the high cost of attrition in UPT. This study looks closely at reducing UPT attrition by greater use of ground based screening techniques, other than light plane screening, and devices currently undergoing testing. In the study the author describes the current screening program and performs a cost benefit analysis of the parts (ie. AFOQT and light plane screening). The benefit analysis indicates an inefficient use of resources in the light plane screening program which is due primarily to the three separate programs being conducted at the time: PIP, FIP, and FSP. He describes the following ground-based screening tests/devices: "the GAT-1 Trainer, the T-40 Instrument Trainer, the Automated Pilot Aptitude Measurement System, the Psychomotor Tests, the Strong Vocational Interest Blank, and the Officer Biographical Attitudinal Survey." He believes a combination of these devices could adequately screen potential UPT eliminatees during a centralized FSP for all pilot candidates. He recommends that either a positive correlation be established between the light plane screening and success in UPT, or the screening should be dropped. Further, he recommends "ongoing work to develop a single screening program for all

UPT candidates." (18:53) (18:--) To date, light plane screening is considerably more cost effective due to the increased utilization of the FSP at Hondo. All OTS and ROTC pilot candidates go through Hondo using the FSP or FIP syllabus. Work continues on developing other tests and testing devices. Psychomotor testing holds the greatest near term potential for screening.

Proposed Modernization of the USAF Pilot Selection System. by Ralph Miller, March 1983. This is the most recent study conducted that examines all of the pilot candidate screening programs used by the USAF. This study like the others is interested in reducing the attrition rates experienced in UPT. The author points out that a great deal of independent study has been conducted in the field of pilot selection (screening). He, further, states that most of the information gained from this study remains unused in the USAF pilot screening programs. In this study the author defines the selection process as recruiting, selecting, and training. He goes on to narrow or focus the study onto what are considered the most important processes in a pilot selection system "...the definition of requirements through the identification of performance characteristics required for piloting and the measurement of these characteristics in the candidate group." (23:11) The author, then, proceeds to describe the current pilot candidate screening programs used by the USAF. He points out that each of the screening programs is tailored by the various commissioning programs in the Air Force ie. the United States Air Force Academy's Pilot Indoctrination Program, the Officer Training School's Flight Screening Program, and the Reserve Officer Training Corps' Flight Indoctrination Program. The study indicates that the screening programs are not standardized but rather are individually designed for a multitude of different roles ie. to motivate, indoctrinate, and/or train; in addition to screening. Finally, the study looks at the various tools used in the screening process ie. the Air Force Officer Qualifying Test (AFOQT) and light plane screening. The study indicates that neither the AFOQT or light plane screening is an accurate predictor of pilot candidate success in UPT. Several of the conclusions/recommendations from this study include: (1) that the USAF's current pilot selection system "...is based on the methods used in the past and is not founded in, or supported by, the selection concepts or methodologies presented in the current research literature."; (23:31) (2) that emphasis be placed on "...the definition of characteristics required to perform the task...and the development of measurement devices for the required characteristics."; (23:31) (3) that a task battery test (possibly one developed by Imhoff and Levine) be used to measure desired task characteristics in pilot candidates;

(23:32) (4) that all pilot candidates, regardless of commissioning source, go through a centralized pilot selection process. (23:32) (23:--)

An Improved Screening Model for ROTC Pilot Candidates. by William Shepard, April 1985. This study, also, looked at ways to improve "...the FIP in order to reduce the high attrition rates in UPT." (24:2) The author outlines the current FIP, indicating very little screening takes place, opting instead to indoctrinate and motivate the ROTC pilot candidates. He goes on to recommend establishing an FIP patterned after the FSP with more emphasis placed on screening than motivation. He uses the CY84 AFROTC test summer encampment and FSP at Hondo to support the need for a more structured and standardized screening process for the FIP. He sums up his whole philosophical model as follows:

In conclusion, effective screening for pilot training results from structured, operational criteria. Syllabus directed training contributes to efficient screening. Competent instruction, combined with operational directives for SIE, MOA, and airsickness, provide the basis for sound training. Screening is an end result of sound training. Impartial evaluation follows competent, standardized instruction. After deficient students are identified through the evaluation process, faculty boards and commanders provide the final quality control for the screening model. Additionally, those students who complete FSP and enter UPT must be carefully monitored. Their UPT progress, or lack of it, should be analyzed and reprogrammed into the screening model. Only through this well-defined, structured process can effective screening take place. (24:27)

The author goes on to recommend the continued use of the FSP at Hondo, the establishment of regional centers (Embry Riddle), the retention of effective FIPs (based on attrition history), and consideration to allow students with private pilot's licenses to enter UPT directly. (24:--) To date, all ROTC students attend FIP at Hondo or Embry Riddle except those with private pilot's licenses who enter UPT directly. (27:--)

First, the literature review confirmed the fact that a great deal of independent research has been conducted on various aspects of the USAF FSPs. Second, it's obvious to this author that if the conclusions and recommendations of these and other studies on the USAF FSP were implemented, a reduction in UPT attrition

would result. Third, the review verified that there was room in the body of knowledge to compare and analyze the FSPs of other nations or services to the USAF FSPs.

A comparison and analysis of the USAF FSP with other FSPs and their associated UPT attrition rates will potentially offer insight on how best to design or structure a FSP. This examination of flight screening is unique, in that it will look at how different designs were developed, in parallel, to identify pilot candidates that would successfully complete UPT. Chapter four will describe the various other FSPs looked at in this study.

Chapter Four

FOREIGN COUNTRY AND USN FSPs

In the preceding chapters the study has described the current USAF FSPs and the research that continues to impact the evolution of those programs. Now, the focus of the study will shift to look at the United States Navy and several foreign country's FSPs. The foreign country FSPs, selected for inclusion in the study, resulted for a number of considerations. Each country selected, as well as the U.S., shares and enjoys a common cultural heritage, a similar political philosophy, and other societal similarities. Each country has its own UPT program patterned similarly after the USAF. Each has a two aircraft system comprised of a primary and advanced phase. All of the countries selected use the same or similar follow-on, operational aircraft. Five countries, out of an original group of seven, are included in the study. These countries represent those which responded with sufficient information for comparison of their respective FSPs. And, of course, the USN was included for the same reasons, plus the similarity to the USAF in the size of its pilot training program.

The basic construct, used in this chapter, describes and presents in a separate table all of the parts in each of the FSPs mentioned above. This approach outlines the various processes used to screen pilot candidates for entry into UPT. The processes include factors which screen for officer potential as well as flying potential. For the purposes of this study no attempt is made to discriminate between these factors. Flying potential is considered a subordinate subset to the officer screening process. Another factor, considered important, was the impact of each FSP on UPT attrition rates. The FSP total process; not the individual screening tools of personal interview, aptitude testing or psychomotor skill testing, etc., were considered when judging the screening impact on UPT attrition rates. Finally, the remainder of this chapter outlines the various FSPs from post recruiting to UPT entry.

UNITED STATES NAVY

The United States Navy (USN) FSP is a centralized program conducted over 14 weeks at Pensacola Naval Air Station (NAS), Florida. The program is one of only two in

the study group that does not include some type of psychomotor or light aircraft screening. Further, it is the only program that does not include either one or the other. The follow-on attrition rate, experienced in Naval Aviation Training, has averaged slightly over 30% per year for the past five years. (36:-->) With the two notable exceptions, the USN's FSP is quite comprehensive as will be shown in the following text.

The screening process for the Naval Aviation Cadet (NAC) applicant begins with a requirement for completion of two years of college credit. Once this requirement is met the applicant's civilian records are reviewed. This review looks for things such as personal credit rating, criminal record, grade point average, and community involvement. The next screening takes the form of an administered series of aptitude tests. (22:-->)

There are two types of tests given. The first is the Academic Qualification Test which evaluates the applicants mathematical and verbal aptitude and mechanical reasoning ability. The second testing series is the Flight Aptitude Rating Tests which cover areas such as technical interpretation, aircraft instrument interpretation, and aircraft and spatial orientation. Depending on the demand for naval aviators, NAC applicant scores are evaluated. Those scoring above the cutoff are sent to Aviation Officer's Candidate School (AOCS) at Pensacola, Florida. (22:-->)

The first order of business, upon arrival at AOCS, is for each NAC to go through a complete flight physical. The USN waits for the NAC to arrive at AOCS to insure physicals are given by knowledgeable flight surgeons and in a centralized and highly standardized manner. This allows for a high degree of quality control. It is infrequent that candidates are subsequently attrited from the training program for medical reasons other than airsickness. (22:-->)

During this phase the NAC is also introduced to aerospace physiological training. The cadet receives academic classroom instruction and spatial disorientation training. This training introduces the cadet to some of the effects and dangers of the flying environment on the mind and body. Through the use of a disorienting device, airsickness tendencies can be detected. (22:Atch 1) It is noted that during this training some cadets experience second thoughts concerning their choice of aviation as a career. (36:-->) This self-evaluation certainly occurs during several of the subsequent training and evaluation courses in the USN, as well as any of the other foreign and USAF FSPs. It serves effectively as a pilot candidate's self-screening device.

At this point the primary screening emphasis shifts to a more traditional training environment. The cadet's training includes academic courses, military discipline, leadership laboratories and exercises and a rigorous physical conditioning program. This marks the beginning of the second phase of AOCS. This part of the screening process introduces a great deal of stress, due to the quantity of training and evaluation, in a time-compressed (14 weeks) program. (22:--)

The academic program consists of two types of study. The first teaches Navy orientation courses such as naval history, law, administration, organization, operations and seapower, and leadership. The second teaches naval aviation oriented courses in aerodynamics, navigation, and seamanship. A cadet's failure to satisfactorily pass academic examinations is cause for elimination from AOCS following, in due course, a review process. (22:--)

In addition to the formal, more traditional academic load placed on the NAC's, the AOCS stresses military discipline and physical conditioning. Both areas are evaluated and used as reasons to screen cadets out of the program for failure to meet standards or adapt to military life. (36:--)

Every pilot understands that discipline in military flying operations is essential whether flying an instrument approach in the weather, leading a formation of aircraft, or operating in a combat zone. In the area of physical conditioning, the program is highly structured leading to two very demanding physical tests. The first requires the cadet to complete a mile and a half run in the sand in a specified period of time. The second requires the cadet to swim a mile in flight suit, in less than an hour and twenty minutes. Both tests must be passed in order for the cadet to graduate. (22:--)

There is one other activity that requires both physical conditioning and military discipline. This activity was popularized in the movie "An Officer and a Gentleman" and is called the "Dilbert Dunker." It's a simulation device in a controlled laboratory setting that simulates an aircraft ditching scenario. It is part of the cadet's water survival training. The cadet is placed in an aircraft cockpit mockup on a rail some twenty feet from the water. The cockpit, when released, slides down the rail impacting the water and turning upside down and submerged. While in this condition, the cadet must rely on his physical conditioning and training discipline to effectively escape the cockpit and reach the surface of the water. This allows for the evaluation of the cadets mental dexterity and discipline in a disorienting and stressful situation. (36:--)

Possibly the most stressed part of the screening program is in the area of leadership. Forty percent of the cadet's total evaluation during AOCS is based on leadership. (22:--> This evaluation looks at the cadet's performance in classroom or laboratory leadership exercises, personal inspections, drill and ceremony, and obstacle course exercises. The screening evaluates the cadet's performance as a leader and follower and team player. Finally, an interview is conducted with each cadet by an experienced training officer. The interview is intended to evaluate a cadet's motivation, suitability, and reason for wanting to become a naval aviator and officer. The cadet's peers also submit a leadership rating. All of this is compiled into an Officer Like Qualities Index and accounts for the forty percent of the total AOCS evaluation as mentioned. If the NAC successfully completes AOCS, it is on to Naval Aviation Training. (36:-->

As mentioned earlier the Navy does not formally conduct a light aircraft screening program. The USN's primary flight training is conducted in the relatively light, propeller driven, T-34 Mentor at Whiting Field, Florida, or Corpus Christi, Texas. Primary training, T-34, accounts for about eighty percent of the total attrition experienced in Naval Aviation Training. (36:--> The only other significant attrition, experienced in Navy flight training, occurs during the carrier qualification phase. A case can be argued that the primary flight training conducted in the T-34 is dual purposed for screening, low performance, and cost flight training. (36:-->

One other interesting note that may have a relevant bearing on the USN FSP is that commissioning and Navy wings are not given until graduation from Naval Aviation Training. Facing elimination, not only from a flying career but also a Navy career, may affect a cadet's motivation to finish the flight program (36:-->

	<u>USN's FSP</u>	
Centralized	Degree - 2 yrs.	Records Review
Interview	Aptitude Tests	Medical Exam
Phys.Strength	Aero Physiology	Motivation
Leadership	Military Tng.	Survival
Academics		

USN's UPT ATTRITION RATE AVERAGE 30%

TABLE 1. USN's FSP Parts

CANADA

Like the USN the Canadian Forces (CF) FSP is centralized, requires no college degree, and conducts no light aircraft screening. The Canadian Forces Aircrew Selection Center (CFASC) controls and conducts a standardized screening process. The entire process is conducted in a period of two days. It is the shortest program of the countries looked at in the study group. The follow on attrition rate experienced in the CF UPT has averaged about 35% over the past five years. (28:--) Due to the short duration look of pilot candidates many areas like motivation, leadership, military discipline, etc. are not considered. A description of the various screening tools used by the CFs follow.

Initially, pilot applicants' civilian records are reviewed. This review looks for things such as criminal or any other unfavorable information, high school grade point average, and community involvement. (16:--) Next, the candidates are given a physical strength test and a complete flight medical evaluation. (16:--) Keeping in mind that the process is highly standardized because of the centralized process. Following the flight physical the applicants are given aptitude tests.

Several types of tests are administered covering a wide spectrum of subject areas. The first tests cover academic areas such as math, writing, and verbal aptitude. The second set of tests looks at areas such as technical material interpretation and concentration skills. The last tests look at the applicant's ability to read aircraft instruments and recognize aircraft attitudes. (16:annex A)

The only other screening device used in the CF's FSP is the GAT-1 that looks at the applicant's psychomotor skills. The GAT-1 is an old Link trainer type device. The testing requires the applicant to keep a sighting device superimposed on a target. The test measures the eye-hand coordination. The target moves at varying rates which negates any applicants previously acquired flying skills. The device measures the applicants success and learning curve improvements or regressions on subsequent tests. (16:5)

Depending on demand for pilot candidates, a cut-off score is determined for each screening period. The total combined scores from all of the individual screening tests are compiled and weighted. This process yields an overall composite score which is then compared to the cut-off level to determine if an applicant is sent to CF's UPT. (28:--)

The pilot candidate is then sent to the C-134 Muskateer and receives twenty seven hours of flight training. (3:1-1)

In actuality the syllabus looks more like the USAF OTS light aircraft screening program than a training program. The elimination rate from the Muskateer program runs about 25%. (28:--) The program also includes academics in aircraft systems, aerodynamics, navigation, flight safety, weather, etc. and lasts thirty nine days. (3:4-1) The 25% is included in the overall UPT attrition average of 35%. Therefore, if the Muskateer attrition was looked at as a part of the FSP the CF's UPT attrition rate would be about 10%.

<u>CF's FSP</u>	
Centralized	Records Review
Aptitude Tests	Medical Exam
Physical Strength	Academics
Psychomotor	

CF's UPT ATTRITION RATE AVERAGE 35%

TABLE 2. CF's FSP Parts

WEST GERMANY

The German Air Force (GAF) conducts a centralized FSP with candidate entry from two separate sources. One entry source enters directly from the civil population and the other from the Armed Forces University. In either case a four year college degree is required. (19:--) The GAF's FSP is one of the more comprehensive processes. The follow-on attrition in UPT, conducted at Sheppard AFB, Texas, was 15.1% as of September 1987. (9:11)

In the GAF's FSP, like most of the others in the study group, initial screening takes the form of a civilian records check and an initial entry interview. The next focus is in the area of aptitude testing. Due to the UPT training conducted in the United States the cognitive skills tests look at verbal skills both in German and English. Another set of tests evaluates the candidates aptitude in mechanics, aircraft instrument readings, and aircraft spatial orientation. (19:--)

Next, the candidate receives a complete flight physical and is tested for physical strength and dexterity. (19:--)

At this point the candidates are at the GAF officer commissioning program, known as OSLW, which is similar in composition and function with the USAF OTS. Early on, the candidates go through aerospace physiology training to include altitude chamber rides and escape/ejection procedures. (19:--)

During the six months the German pilot candidate is at OSLW, he participates in academic courses on aerodynamics, weather, navigation, basic maneuvers, aircraft engineering, etc. (30:--). During this whole period of time, the pilot candidates are extensively trained and indoctrinated in military discipline in the classroom and in field exercises. Another part of the screening looks at each candidate's abilities in the areas of leadership and followership which is all included as a subset of officer qualities. (19:--)

One additional area of training and screening, while at OSLW, centers around physical conditioning and introduction to both land and water survival. The rigors of these programs truly test the endurance, stamina, and mental fortitude of the GAF's pilot candidates. At any point in the program, if deficiencies are noted a review process can be initiated to consider eliminating a candidate from the FSP. (30:--). At the end of the six months, the pilot candidate is commissioned into the GAF and moves on to light aircraft screening.

Light aircraft screening is conducted in the Piaggio, P-149D, at Fuerstenfeldbruck, Germany. The program is six weeks long and consists of academic course work and 22 hours for flight screening. The academic program consists of classes on aerodynamics, navigation, weather, and aircraft systems instrumentation, etc. (30:--)

The flying portion of the FSP emphasizes basic aircraft control, stalls, turns, traffic pattern procedures, landings, and one solo ride. During this phase of the screening process, the pilot candidates are monitored for adaptability to stressful situations and tendencies to become airsick. Following a final checkride a review board makes a final assessment on each candidate's potential. After this review each candidate that successfully completes the screening receives a follow-on assignment. The new officers go either to Sheppard Air Force Base for the EURO-NATO Joint Jet Pilot Training (ENJJPT), which leads to fighters, or stays in Germany for transport aircraft training. The overall attrition rate for the GAF's UPT pilot candidates at ENJJPT was 15.1% in FY 87. (19:--). The GAF's FSP light aircraft attrited 25% before candidates were sent to UTP. (30:--)

GAF's FSP

Centralized	Degree
Records Review	Interview
Aptitude Tests	Medical Exam
Physical Strength	Aero Physiology
Motivation	Leadership
Military Training	Survival
Light Aircraft	Academics

GAF's UPT ATTRITION RATE AVERAGE 15%

TABLE 3. GAF's FSP Parts

ITALY

The Italian Air Force (IAF) conducts another centralized FSP along with a commissioning program at the military academy. The entire program is two years in duration culminating in the awarding of a degree and commission in the IAF. The most unique feature of the Italian's FSP is the way the light aircraft screening is broken into two phases separated by a year's time. The program also uses the psychomotor Portabat Test still being validated for use in the USAF FSP. The follow-on attrition rate experienced in the IAF's UPT, is an 18.5% average over the last three years. (26:--)

Initially, the Italian cadet's civilian records are reviewed for positive and negative personal factors. Next, the cadets are given aptitude tests in areas of academic intelligence and flight qualification testing. These are similar in nature to the other aptitude tests given by other nations included in the study group. (26:--)

After successfully completing the aptitude tests, the cadets are given physical strength tests and a flight physical. During this initial phase the cadets are given an interview to determine their motivation toward an Air Force career, political values, world politics and current affairs. (26:--)

Throughout the commissioning process the cadets are trained and screened in all manner of military discipline and leadership. This training takes place in the classroom and in controlled laboratory situational experiences. If deficiencies are noted by the training officers, cadets are

eliminated from the program through a review board mechanism.
(26:--)

During the cadet's first year the light aircraft flying program begins with academics and 19 sorties in an acrobatic-capable, propeller driven aircraft. The academics stress aircraft systems, aerodynamics, navigation, etc. The aircraft sorties are intended to provide motivation and screen for cadets that are prone to airsickness. This is similar in nature to the USAFA "Soar For All" program. Then, during the second year another 18 sorties are flown which are primarily for screening out potential UPT eliminees. This phase is similar to the USAF OTS FSP program. (34:--) All of the pilot candidates are given the Portabat psychomotor testing prior to the second year FSP. The psychomotor test is the same system being validated for use in the USAF FSP. In Italy it is being used to help screen out potential UPT eliminees. It is a computerized device that measures eye-hand coordination and learning curve. (34:--)

IAF's FSP

Centralized	Degree
Records Review	Interview
Aptitude Tests	Medical Exam
Physical Strength	Aero Physiology
Psychological	Motivation
Leadership	Military Training
Survival	Light Aircraft
Academics	

IAF's UPT ATTRITION RATE AVERAGE 18.5%

TABLE 4. IAF's FSP Parts

ISRAEL

The Israeli Air Force (IAF) has the most unique screening program of any country or service included in the study group. They still conscript their military forces right out of high school (no degree requirement). As such, the IAF is in a unique and envied position of having some 5,000 applicants for 200 pilot training slots annually. In the area of flight screening, the IAF integrates every type of screening from initial interviews with a psychiatrist to an actual survival trek and psychomotor and light aircraft programs. The follow-on attrition is high at 50% but is easily explained due to the tremendous numbers being

processed through the system. (31:-->) This may be the reason their Air Force has enjoyed such high success in combat.

Initially, the IAFs candidates' civilian records are reviewed for any negative screening factors. During this initial screening the candidates are interviewed by a psychiatrist concerning attitude, motivation, political views, current world events, and numerous other psychological areas of consideration. This is the only screening program in the study group that employed any type of psychiatric screening technique. (31:-->)

Like most of the other FSPs, the IAF candidates take a series of tests early in the screening process. These tests include a physical strength test, medical exam, and a number of aptitude tests. The tests cover such areas as logic, psychological profile, verbal comprehension, world events, politics, etc., and aircraft attitude and instrument readings. (31:-->)

Psychomotor testing uses a manual device that tests eye-hand coordination. The pilot candidate simply keeps a ball on a predetermined course with time and accuracy used to compile a score. Through repetitive tests at varying speeds, a learning curve projection can be determined. After the testing is completed, composite scores are compiled with the aptitude and coordination tests receiving weighted scores. (31:-->)

Those candidates that make the screening cut from testing are sent to the Army where military basic training is conducted for six weeks. This training includes military skills, discipline, and leadership exercises as well as survival treks. (31:-->)

Following successful completion of basic and survival training, the candidate returns to the IAF for light aircraft screening in the Piper Cub aircraft. The flight portion is a seven week course with 15 flight hours. The program emphasis is the candidates' ability to adapt to the stress which is related to a new aerial flight environment and spatial orientation. (1:-->) Accompanying academic courses include aerodynamics, electrical engineering, math, physics, and aviation medicine. (15:14)

Upon completion of the screening program, the candidates enter the IAF UPT program.

IAF's FSP

Centralized	Psychiatric
Records Review	Interview
Aptitude Tests	Medical Exam
Physical Strength	Academics
Psychological	Motivation
Leadership	Military Training
Survival	Light Aircraft
Psychomotor	

IAF's UPT ATTRITION RATE AVERAGE 50%

TABLE 5. IAF's (Israeli) FSP Parts

GREAT BRITAIN

The Royal Air Force (RAF) conducts a centralized screening program administered by the RAF Support Command. The most unique feature other than it's being a very comprehensive screening program is the extensive light aircraft screening and training phase. (35:--) The resultant washout rates of 5% gives the RAF UPT the lowest attrition rates of any nation in the study group. (4:--)

Once again the RAF doesn't require an applicant to have an advanced degree. (5:--) Following application for admission into the RAF the screening starts with an initial records review. Following the records review the candidate is given a series of tests that measure academic and flying aptitudes. Next the candidate is interviewed and given a medical exam. The aptitude test looks at areas such as aircraft instrumentation, symbol recognition, verbal and math skills, etc. (6:--)

Following testing an RAF officer team conducts psychological profiles on the candidates. The interviewer questions the candidate on background, motivation to join the RAF, political views, and current world affairs. (6:--)

Next, a computer generated psychomotor test is used to evaluate reaction time, sense of timing, and coordination of the eyes, hands and feet. The system requires the candidate to track a target. It is similar to a computerized game and is scored automatically by the computer. (6:8) These scores are tabulated and weighted. At the conclusion of this phase of screening, a selection board meets to assess scores and determine the selected candidates. (6:10)

Following selection, pilot candidates go to the light aircraft screening portion of the process. During this program acrobatics, basic instruments, and navigation skills are taught. It is the most extensive light aircraft screening and training program used by any nation in the study group. While in this sixteen week phase the candidates receive some 63 hours in the Chipmunk aircraft. In addition the following academics are taught: aerodynamics, instruments, navigation, communications, aviation physiology, etc. (7:--) The attrition rate during the light aircraft screening and training phase is approximately 25%. However, the attrition rate in the RAF UPT equivalent is only 5%. (4:--)

<u>RAF's FSP</u>	
Centralized	Academics
Records Review	Interview
Aptitude Tests	Medical Exam
Physical Strength	Aero Physiology
Psychological	Motivation
Leadership	Military Training
Psychomotor	Light Aircraft

RAF's UPT ATTRITION RATE AVERAGE 5%

TABLE 6. RAF's FSP Parts

These descriptions provide a base of information for comparison with the USAF FSPs to address possible improvements to the screening process to reduce UPT attrition rates. Chapter five will look at this problem and offer recommendations.

Chapter Five

CONCLUSIONS

In the previous chapters this study has looked at the USAF FSPs related studies on flight screening, five foreign countrys' FSPs, and the USN's FSP. Here, all of the pieces should come together to offer some comparative analysis and draw some conclusions about what could be done in the FSPs to reduce UPT attrition rates. Table 7 presents a snapshot of the various parts or characteristics of the FSPs described in chapters two and four. It can be said that there are many more similarities between the FSPs than there are differences. However, the differences are worth exploring as they may possibly offer the key to reducing attrition rates in the USAF UPT.

<u>FSPs</u>	<u>USN</u>	<u>CAN</u>	<u>GER</u>	<u>IT</u>	<u>ISR</u>	<u>UK</u>	<u>USAF</u>
<u>PARTS</u>							
Centralized.....	YES...	YES...	YES...	YES...	YES...	YES...	NO
Degree.....	2yr...	NO...	YES...	YES...	NO...	NO...	YES
Records Rev.....	YES...	YES...	YES...	YES...	YES...	YES...	YES
Interview.....	YES...	NO...	YES...	YES...	YES...	YES...	NO
Aptitude Test.....	YES...	YES...	YES...	YES...	YES...	YES...	YES
Physical.....	YES...	YES...	YES...	YES...	YES...	YES...	YES
Medical Exam.....	YES...	YES...	YES...	YES...	YES...	YES...	YES
Psychological.....	NO...	NO...	NO...	NO...	YES...	YES...	NO
Psychiatric.....	NO...	NO...	NO...	NO...	YES...	NO...	NO
Air Physiology.....	YES...	NO...	YES...	NO...	?	YES...	NO
Motivation.....	NO...	NO...	YES...	YES...	YES...	YES...	NO
Leadership.....	YES...	NO...	YES...	YES...	YES...	YES...	YES
Military Tng.....	YES...	NO...	YES...	YES...	YES...	YES...	YES
Survival.....	YES...	NO...	YES...	NO...	YES...	NO...	NO
Psychomotor.....	NO...	YES...	NO...	YES...	YES...	YES...	NO
Light Acft.....	NO...	NO...	YES...	YES...	YES...	YES...	YES
Academics.....	YES...	NO...	YES...	YES...	YES...	YES...	YES
UPT Attrition	30%	35%	15%	19%	50%	5%	37%

Table 7. Compiled USAF, USN & Foreign FSPs Parts

In order to get a more manageable grouping of the data represented in table 7, the FSP parts or characteristics have been grouped into broader screening categories. For the purpose, of this study these screening categories are administrative, physical, academic, and light aircraft screening. In the remainder of his chapter, each of these screening categories will be analyzed for similarities and differences between the FSPs examined in the study group. Following the analysis of each of these screening categories,

recommended changes to the USAF FSP that would result in lowered attrition rates in UPT will be made.

First, the administrative category includes the following FSP parts: centralization, advanced degree, records review, personal interview, and aptitude testing. As is readily seen by referring to table 7, the similarities in this area of screening far out-weigh the differences.

The USAF is conspicuous in the area of centralization. With the three FSPs, each associated with one of the various commissioning sources, the U.S. doesn't have a centralized or standardized approach to screening pilot candidates for UPT. The studies, examined in chapter three, have constantly called for greater centralization and standardization in the USAF FSPs. This process is, in an evolutionary manner beginning to take place with the AFROTC program, becoming more standardized with the FSP at Hondo. However, it is this author's opinion, that every pilot candidate should be screened through a series of regionally located facilities, due to the size of the U.S. pilot training program, patterned after the FSP at Hondo.

The only other notable exception is in the area of an advanced degree requirement. The United States, German, and Italian Air Forces are the only FSPs that require a four year degree to enter UPT. The United States Navy requires only two years of college and Canada, Israel, and the United Kingdom require no degree. The countries that require a degree do so to screen for officer qualities more than for flying skills. A degree requirement for entry into UPT does affect the average age of the pilot candidate population by some four years. This increased UPT population age could result, though unsubstantiated, in higher medical, stress related, and other physiological problems in UPT.

One other minor difference noted is the absence of an interview process for pilot candidate's in the USAF and Canadian FSPs. Every other nation has, to one degree or another, an interview process which tries to gain a better appreciation for the pilot candidates reasons for wanting a flying career. A statistical correlation between an interview process and attrition rates in UPT would very possibly prove impossible. However, in the overall picture of the different FSP processes, the interview adds one more facet, to the total and comprehensive effort to evaluate a candidates potential to successfully complete UPT.

The second category deals with physical screening which includes: physical strength/dexterity, medical examination, psychological examination/testing, psychiatric evaluation,

and aerospace physiology evaluation. Again, like the administrative screening, there are more similarities than differences in this area.

All of the FSPs test for physical strength/dexterity and medical examinations. This area is probably the most standardized type of screening given by all of the nations examined in the study group.

In the area of mental health, only Italy, Israel and the United Kingdom actively work with psychological testing to determine a pilot candidate's suitability to go on to UPT. In this area the Israelis go one step further to include a psychiatric interview. Once, again, in a total program designed to screen not only the best and worst pilot candidates but also differentiate between the best of the average candidates, this type of screening could be a tie-breaker. However, the utility of this type of screening, in a program as large as the USAF FSPs may not prove feasible.

Another screening device in this category is the use of aerospace physiology devices and training. This area of screening is split evenly among the countries in the study group. The USN, Germany, and the United Kingdom use combinations of altitude chamber rides, disorienting devices, and escape and ejection devices to identify early those candidates which should be closely monitored or eliminated before UPT. Incorporating this screening/training early in the pilot selection process could prove beneficial. This screening/training is present in every UPT program. Therefore, the earlier the candidate is identified as having airsickness, inner ear problems, etc., the greater the savings. This savings is realized in avoided training costs and better management of the training pipeline leading to UPT.

Third, the academic category includes the following FSP parts: motivation, leadership, military, and survival. Much of what is in this category falls into a gray area of training or screening. Most of the training is academic in nature and as such is testable. Failure to progress results in elimination or being screened from the program. Additionally, most of these activities take place in conjunction with commissioning programs.

All of the FSPs with the exception of Canada looks at military training and leadership training in association with commissioning programs. The Canadian FSP is excluded technically, because it is only composed of the two day administrative and physical screening. These qualities are taught and screened for in any officer commissioning program.

It is obvious that these qualities are important in any flying operation and should be screened.

Motivation is another area where the study group was split. The programs range from no attempt to determine motivation, like the USAF, USN, and Canada, to detailed programs like that in Israel. The extensive use of psychological, psychiatric, and interviewing techniques is used in Israel attempt to determine if the pilot candidate will not only succeed in UPT but also make a good fighter pilot. This is one of the areas the "Hasty Blue" project directed attention to and could prove a beneficial mechanism for making narrowly defined decisions on whether or not a candidate should be sent on to UPT.

The last area examined in this category is survival training/screening. Once again, this area is split from none in the USAF, United Kingdom, Italy, and Canada to a very extensive program in Israel involving cross country treks, etc. This is another area like aerospace physiology training that could be placed prior to UPT to screen for adaptability and help better manage the training pipeline.

The fourth and last category is the light aircraft category which includes the following FSP parts: light aircraft screening, psychomotor testing, and academics. It is this author's opinion that this area offers the greatest potential based on the study group data to reduce the attrition rates in the USAF.

The USN, USAF, and Germany are the only nations in the study group not using psychomotor testing. The USAF is testing the use of psychomotor testing but to date is not using the results to screen pilot candidates. The countries using psychomotor testing experience on the average lower attrition rates in UPT. Israel is the exception, but this is understandable due to the large number of applicants for UPT and the limited number of UPT slots.

All of the countries that have actual light aircraft screening have flightline academics which include systems, aerodynamics, etc. The actual light aircraft programs run the range from none in Canada and the USN to extensive programs as in the United Kingdom where the pilot candidate receives some 63 hours of flight screening and instruction. It is this program that the author feels offers the single greatest opportunity to reduce the attrition rates in UPT. In the United Kingdom the RAF UPT attrition rate has dropped to 5% following the introduction of an expanded light aircraft screening program. The attrition was approximately 30% in the RAF's UPT prior to the expansion of the Chipmunk

program from 14 hours to 63 hours. (35:--) The other nations and services, especially if you include the USN's T-34 and the Canada's follow-on flight screening/training programs, with the more extensive use of light aircraft screening/training have the lowest attrition rates in their respective UPT programs. It is the author's view that if an expanded screening and training program were adopted by the USAF attrition rates in UPT would be reduced substantially.

Finally, some final thoughts are to continue to implement the guidance established in the "Hasty Blue" project which was to:

...develop, test and validate selection techniques. Concentration will be on: psychomotor testing, attitude and career intent measures, use of the GAT-1, use of an altitude chamber, and motivational indoctrination....Later, when resources permit, Basic Survival School may be tested as a pre-UPT screening device. For any new technique, validation prior to adoption is essential, even though such development and validation will be a lengthy process. However, new techniques, will be incorporated into the operative system as they are found to be valid and reliable. Concurrently, the T-41 FSP may be reduced, altered to incorporate more efficient in-flight screening techniques, or replaced entirely by validated ground-based screening procedures. Thus the objective may be attained through an evolutionary process. (10:3)

Though the "Hasty Blue" project was implemented some fifteen years ago it is still the most relevant document the USAF has today on how to improve flight screening. The project concept called for the administrative, physical, academic and light aircraft screening groupings, as used in this study, to be further developed into a comprehensive FSP. Many of the other service and foreign countries examined in this study, have evolved to more comprehensive FSPs than the USAF. If the USAF will take the specific steps noted in this chapter and continue to actively follow the intent of the "Hasty Blue" project lower attrition rates will follow in UPT.

BIBLIOGRAPHY

A. REFERENCES CITED

Articles and Periodicals

1. Belenky, Gregory L. et al. "Battle Stress: The Israeli Experience," Military Review, July 1985, pp. 130-139.
2. Willis, Grant. "New Porta-BAT Helps Predict Successful Pilots," Air Force Times, 17 November 1986, p. 8.

Official Documents

3. Canadian Forces. CT134 Musketeer Primary Flying Training. CFB Winnipeg, Manitoba, Canada, 1986.
4. Hartree, William F. Squadron Leader, Royal Air Force. "Elementary Flying Training." Official Letter. Headquarters Air Training Command, Randolph Air Force Base, Texas, 23 October 1987.
5. Royal Air Force. Commissioning as Aircrew Officers in the Royal Air Force. Royal Air Force Pamphlet 96, Great Britain, August 1984.
6. _____. Officer and Aircrew Selection Centre. Royal Air Force Biggen Hill, Great Britain, 1987.
7. _____. Pilot Training Pattern. Royal Air Force Support Command, Great Britain, 3 February 1986.
8. United States Department of the Air Force: Air Force Academy. Syllabus of Instruction for USAF Academy Pilot Indoctrination Program (T-41). USAF Academy, Colorado, May 1987.
9. U.S. Department of the Air Force: Air Training Command. Attrition by Source/by Cause. Randolph Air Force Base. Texas. September 1983.
 - _____. Attrition by Source/by Cause. Sept 1984.
 - _____. Attrition by Source/by Cause. Sept 1985.
 - _____. Attrition by Source/by Cause. Sept 1986.
 - _____. Attrition by Source/by Cause. Sept 1987.

10. United States Department of the Air Force: Air Training Command. Plan for Centralized Selection of Students For Undergraduate Pilot Training (Project Hasty Blue). Randolph Air Force Base, San Antonio, Texas, 1973.
11. United States Department of the Air Force: Air Training Command. "Syllabus of Instruction for Flight Screening Program: T-41." Randolph Air Force Base, Texas, May 1985.
12. _____. "Syllabus of Instruction for Light Aircraft Training for ROTC (LATR)." Randolph Air Force Base, Texas, May 1987.
13. United States Department of the Air Force: Air Force Reserve Officer Training Corps. Air Force ROTC Selection, Enrollment, and Reporting System. AFROTC Regulation 45-13. Maxwell Air Force Base, Alabama, September 1986.
14. United States Department of the Air Force: H.Q., Pentagon. "Pilot Selection and Screening Conference." Official Meeting Minutes, Headquarters United States Air Force, Deputy Director for Personnel Programs, Washington D.C., 3 June 19.

Unpublished Materials

15. Beale, Robert S., LtCol, USAF. "Pilot Training and Operational Training in the Israeli Air Force." Unpublished Staff Problem Solving Report, Air War College, Air University, Maxwell Air Force Base, Alabama, 1972.
16. Canada: Canadian Forces. "Aircrew Selection Procedures." Unpublished Standard Operating Procedures. CFB Winnipeg, Manitoba, Canada, 1979.
17. Cox, John A. et al. "Evaluation of Light Plane Training Among AFROTC Student Officers." Research project 7719, Wright Air Development Center, Air Research and Development Command, Lackland Air Force Base, Texas, July 1959.
18. Flitschen, Charles K. Maj, USAF. "Cost Impact Should Improved Screening Methods be Implemented in the Undergraduate Pilot Training Program." Research study 0870-81, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, May 1981.

19. Goerz, Hans-Holger, Capt, German Air Force. "German Air Forces Screening." Official Letter. Headquarters 80th Flying Training Wing, Sheppard Air Force Base, Texas, 23 October 1987.
20. Hickman, Donald W., Maj., USAF. "Flight Screening A Better Way?" Research Study, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, May 1975.
21. Hunter, David R. et al. "Pilot Selection System Development." Air Force Human Resources Laboratory Report TR-78-33, Brooks Air Force Base, Texas, July 1978.
22. Kennedy, David L., Lt, USN. "Aviation Officer Candidate Screening." Official Letter. Headquarters Aviation Officer Candidate School, Naval Air Station Pensacola, Florida, 20 November 1987.
23. Miller, Ralph L., Maj, USAF. "Proposed Modernization of the USAF Pilot Selection System." Unpublished Staff Report. Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, 1983.
24. Shepard, William E., Maj, USAF. "An Improved Screening Model for ROTC Pilot Candidates." Student report 85-2375. Air Command and Staff College, Air University, Maxwell Air Force Base Alabama, April 1985.
25. Wojack, Ronald P., Maj, USAF. "View of an Inovative Change to the AFROTC Flight Instruction Program." Student report 2690-81, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, May 1981.

Other Sources

26. Camporini, Enzo, Col, Italian Air Force. Rome, Italy. Personal interview. 9 February 1988.
27. Cohick, Michael, Capt, USAF. Headquarters Reserve Officer Training Corps, Maxwell Air Force Base, Alabama. Personal interview. 16 January 1988.
28. Faulkner, Larry, Maj, Canadian Air Force. 14th Training Group Headquarters, Manitoba, Canada. Personal Interview. 16 January 1988.

29. Gilpin, Glen, Capt, USAF. Headquarters Reserve Officer Training Corps, Maxwell Air Force Base, Alabama. Personal interview, 13 January 1988.
30. Goerz, Hans-Holgen, Capt, German Air Force. Headquarters 80th Flying Training Wing (80FTW/DOV), Sheppard Air Force Base, Texas. Personal interview, 8 October 1987.
31. Keldar, Shamai, LtCol, Israeli Air Force. Air Command and Staff College Class of 1988, Maxwell Air Force Base, Alabama. Personal interview. 9 February 1988.
32. Poronsky, Paul, Capt,. Officer Training School, Lackland Air Force Base Texas. Personal interview. 14 June 1988.
33. Scruzyk, Pam. Directorate of Cost, Flying Training, Survival and Medical Program Branch, (HQ ATC/ACCEB). Personal interview. 11 April 1988.
34. Stoppolini, Bruno, LtCol, Italian Air Force. Senior National Representative, 80 FTS Sheppard Air Force Base, Wichita Falls, Texas. Personal interview. 9 March 1988.
35. Vary, Ted G., Squadron Leader, Royal Air Force, London, England. Personal interview. 14 January 1988.
36. Wyatt, Randall E., Commander, USN. Naval Air Systems Command. Washington DC. Personal interview. 13 January 1988.

B. RELATED SOURCES

Books

- Cronbach, Lee J. et al. Psychological Tests and Personnel Decisions. Urbana: University of Illinois Press, 1957.
- Sloan, J.C. et al. Pilots Under Stress. New York: Routledge and Kegan Paul, 1986.

Official Documents

- Canada, Canadian Forces. Royal Air Force University Cadetships and Bursaries. Royal Air Force Pamphlet 296, Great Britain, December 1986.

Congress. House 84th Congress, 2nd Session, House Report No. 5738. Flight Training for ROTC. Washington D.C.: Government printing office, 1956.

U.S. Department of the Air Force. Reserve Officer Training Corps. "Pilot Selection System," talking paper. Maxwell Air Force Base, Alabama, 23 September 1982.

_____: Air Force Systems Command. "The Psychology and Physiological Selection of Flight Personnel," talking paper. Wright-Patterson Air Force Base, Ohio, 5 February 1974.

_____. Psychological Research on Pilot Training. Report number 8. Washington D.C.: Government Printing Office, 1947.

U.S. Department of the Army. Psychological Research on Operational Training in the Continental Air Forces. Report number 16. Washington D.C.: Government Printing Office, 1947.

U.S. Department of the Navy: Aviation Medicine. "The Combat Criterion Program." Aviation psychology technical memorandum. Washington D.C., December 1944.

_____: Aviation Medicine. "Construction of Keys X, Y, and, Z for the Geographical Inventory." Aviation psychology technical memorandum. Washington D.C., November 1944.

_____: Aviation Medicine. "The Prediction of Combat Performance of Naval Aviation by Means of Psychological Tests." Aviation psychology technical memorandum. Washington D.C., February 1945.

_____: Aviation Medicine. "Preliminary Studies of Combat-Category Arrangement." Aviation psychology technical memorandum. Washington D.C., May 1945.

Unpublished Material

Adams, Jack A. et al. "Part-Versus Whole-Task Learning of a Flight Maneuver." Technical report 297-1. U.S. Naval Training Device Center, Port Washington, N.Y., June 1960.

Baer, Lester H. and James D. Beggerly, Capts., USAF. "Teaching a UPT Academic Course in the Learning Center." ATC Project Report 72-7, 3525th Pilot Training Wing, Williams Air Force Base, Arizona, September 1972.

- Booth, Richard F. et al. "Factor Analysis of Aviation Training Measures and Post-Training Performance Evaluations." Research study prepared by the Naval Aerospace Medical Institute, Naval Aerospace Medical Center, Pensacola, Florida, 1968.
- Caro, Paul W. et al. "Changes in Flight Trainee Performance Following Synthetic Helicopter Flight Training." Professional paper presentation at twelfth annual meeting of the Southwestern Psychological Association, New Orleans, Louisiana, April 1966.
- Caro, Paul W. et al. "Research on Synthetic Training Device Evaluation and Training Program Development." Technical report 73-20, Human Resources Research Organization, Fort Rucker, Alabama, September 1973.
- Clark, Herbert J. et al. "Flying Training R and D at the Air Force Human Resources Laboratory." Report AFHRL-TP-83-24, Plans and Programs Office, Brooks Air Force Base, Texas, June 1983.
- Elder, Robert J., Maj, USAF. "Optimizing Pilot Behavior to Exploit the Capabilities of Future Cockpit Systems." Research study 87-0770, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, 1987.
- Eggenberger, J.C., Maj, Royal Air Force. "Pilot Selection Research System." Research report, Canadian Forces Personnel Applied Research Unit, Toronto, Ontario, Canada, 1976.
- Finnegan, J.P. "Evaluation of the Transfer and Cost Effectiveness of a Complex Computer-Assisted Flight Procedures Trainer." Technical report HRL-77-7/AFOSR-77-6, Aviation Research Laboratory Institute of Aviation, University of Illinois, Willard Airport, Savoy, Illinois, June 1977.
- Foley, John P. et al. "Studies of Predictors of Achievement in Learning to Fly." Research report, Civil Aeronautics Administration, Division of Research, Washington D.C., March 1944.
- Gopher, Daniel et al. "The Measurement of Operator Capacity by Manipulation of Dual-Task Demands." Scientific Interim report, Air Force Office of Scientific Research, Cameron Station, Arlington, Virginia, October 1974.
- Hill, John W. "Further Development of Automated GAT-1 Performance Measures." Unpublished report AFHRL-TR-73-72. Flying Training Division, Williams AFB, Arizona, May 1974.

- Hixon, Carroll W. et al. "Airsickness during Naval Flight Officer Training." Medical research report MF58.524. 005-7032, Naval Medical Research and Development Command, Naval Air Station, Pensacola, Florida, August 1980.
- Iverson, Marvin A. et al. "Motivation for Flying Among Basic Airmen." Technical memorandum 77040, Personnel Research Laboratory, Air Research and Development Command, Lackland Air Force Base, Texas, October 1955.
- James, J.A., Capt, Canadian Forces. "Aircrew Aptitude Test Battery: Psychometric Evaluation and Revised Norms." Unpublished research Report, Canadian Forces Personnel Applied research Unit, Willowdale, Ontario, Canada, July 1976.
- Kipnis, Gregory M., Capt, USAF. "A Model for Balancing Aggregate Pilot Production over a Planning Period." Manpower analysis project report 70-1, Manpower Resource Analysis Branch, Directorate of Manpower and Organization, HQ USAF, Washington D.C., February 1970.
- Meyer, Donald E., Ed.D. et al. "A Study of Simulator Capabilities in an Operational Training Program." Research report AMRL-TR-67-14, Aerospace Medical Research Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, May 1967.
- Meyer, Robert P. et al. "Behavioral Taxonomy of Undergraduate Pilot Training Tasks and Skills: Taxonomy Refinement, Validation, and Operations." Unpublished Interim report AFHRL-TR-74-33(III), Flying Training Division Air Force Human Resources Laboratory, Williams Air Force Base, Arizona, 1974.
- Meyer, Robert P. et al. "Behavioral Taxonomy of Undergraduate Pilot Training Tasks and Skills: Guidelines and Examples for Taxonomy Application in Flying Training Research." Final report AFHRL-TR-74-33(IV), Flying Training Division, Williams Air Force Base, Arizona, December 1974.
- Mullins, Cecil J. "Evaluation of the AFROTC Flight Instruction Program." Research project 7717, Wright Air Development Division, Air Research and Development Command, Lackland Air Force Base, Texas, April 1960.
- Newman, T. "Cross Validation of the Defense Mechanism Test by the Criterion of Passing or Failure in Basic Military Flight Training." Unedited rough draft translation research paper FTD-HC-23-1149-72, Foreign Technology Division, Wright-Patterson Air Force Base, Ohio, October 1972.

- Orlansky, Jesse. et al. "Operating Costs of Aircraft and Flight Simulators." Institute for Defense Analysis paper P-1733, Alexandria, Virginia, March 1984.
- Purifoy, George R. "Instructional Methodology and Experimental Design for Evaluating Audio/Video Support to Undergraduate Pilot Training." Technical report AFHRL-TR-68-5, Air Force Human Resources Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, October 1968.
- Schumacher, Sanford P. et al. "Evaluation of a Low Cost In-Flight Audio/Video Recording System for Pilot Training." Technical report AFHRL-TR-69-31 Air Force Human Resources Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, January 1970.
- Smode, Alfred F. et al. "An Assessment of Research Relevant to Pilot Training." Technical report 804600, Defense Documentation Center, Cameron Station, Alexandria, Virginia, November 1966.
- Smode, Alfred F. et al., "An Assessment of Research Relevant to Pilot Training." Unpublished Research Report, Aerospace Medical Research Laboratories, Wright-Patterson Air Force Base, Ohio, 1966.
- Swartz, W.F. "Human Engineering; Pilot Factors Program." Final Summary Report AF33(616)-7752, Behavioral Sciences Laboratory, Aerospace Medical Research Laboratories, Wright-Patterson Air Force Base, Ohio, September 1964.
- "The Psychological and Physiological Selection of Flight Personnel." Research study FTD-HC-23-664-73 prepared by the Foreign Technology Division, Translation Division, Wright-Patterson Air Force Base, Ohio, 1973.
- "Training Responsibility Between Representatives of the Air Training Command and the Air University." Conference report HQ Air Training Command, Barksdale Air Force Base, Louisiana, November, 1948.
- Tupes, Ernest C. et al. "Predicting Motivation for Flying Training." Research report project 503-002-7701, Air Force Personnel and Training Research Center, Air Research and Development Command, Lackland Air Force Base, Texas, June 1955.
- U.S. Department of the Air Force: U.S. Air Force Reserve Officer Training Corps. "AFROTC Pilot Selection Methodology" position paper, Maxwell Air Force Base, Alabama, 16 August 1982.

_____. "Evaluation of the AFROTC Flight Instruction Program," report, Lackland Air Force Base, Texas, April 1960.

_____: Air Research and Development Command. "Evaluation of Light Plane Training Among AFROTC Student Officers," report, Lackland Air Force Base, Texas, July 1959.

_____: Air Force Systems Command. "Further Development of Automated GAT-1 Performance Measures," report, Brooks Air Force Base, Texas, May 1974.

_____. "Predicting Motivation for Flying Training Among Senior AFROTC Cadets," report, Lackland Air Force Base, Texas, June 1955.

U.S. Department of the Air Force. Air Training Command. "Syllabus of Instruction for Flight Instruction Program." Randolph Air Force Base, Texas, April 1985.

Valverde, Horace H. "Summary of the Development and Evaluation of the Audio/Video Recording System for Pilot Training." Training Research Division, Wright-Patterson Air Force Base, Ohio, March 1970.

Williams, A.C. et al. "Preliminary Experimental Investigations of 'Tension' as a Determinant of Performance in Flight Training." Investigative report 54, Civil Aeronautics Administration, Washington D.C., January 1946.

Wood, Milton E. et al. "Transfer from Audiovisual Pretraining to a Continuous Perceptual Motor Task." Report AFHRL-TR-74-8, Flying Training Division, Williams Air Force Base, Arizona, March 1974.

END

DATE

FILMED

8-88

DTIC